

**REMARKS**

Claims 1-51, 53-92, and 97-135 are currently pending in the present application.

Applicant acknowledges with appreciation the indication of allowable subject matter in claims 18-25, 46, 47, 67-70, 91, 92, 107-109, 124 and 131. Claims 1-8, 11-17, 26-36, 41-45, 48-51, 53, 59-66, 71-78, 87-90, 101-106, 110-115, 122, 123, 125, 126, 129, 130, 132 and 133 have been withdrawn from consideration. Applicants respectfully request reconsideration of the application in view of the following remarks.

1. Claims 9-10, 37-40, 54-58, 79-86, 97-100, 116-121, 127-128, 134-135 have been rejected under 35 U.S.C. §103(a) "as being unpatentable over DiGiovanni et al. ('236) in view of DiGiovanni et al. ('652)." This ground of rejection is respectfully traversed because each of the recited claim elements is not found in the cited references.

The present invention deals with a photonic bandgap (PBG) optical fiber comprising cladding features constituting a substantially two-dimensional periodic structure, when viewed in a cross section perpendicular to a longitudinal axis of the fiber. This type of fiber guides light due to the photonic bandgap effect. DiGiovanni et al. ('236) deals with a non-periodic micro-structured optical fiber that guide light by index guiding, but do disclose a PBG-type fiber in Figures 1 and 2. DiGiovanni et al. ('652) deals with an air-clad optical fiber that guide light by index guiding.

In section 3 of the office action, the Examiner argued that claim 54 is disclosed by DiGiovanni et al. ('236) in view of DiGiovanni et al. ('652).

Specifically, independent claim 54 states:

54. An optical fibre with a waveguide structure having a longitudinal direction, said optical fibre having:

- a core region extending along the longitudinal direction,
- a cladding region extending along the longitudinal direction, said cladding region comprising an at least substantially two-dimensionally periodic structure comprising primary, elongated elements each having a centre axis extending in the longitudinal direction of the waveguide, the primary elements each having a refractive index being lower than a refractive index of any material adjacent to the primary element,

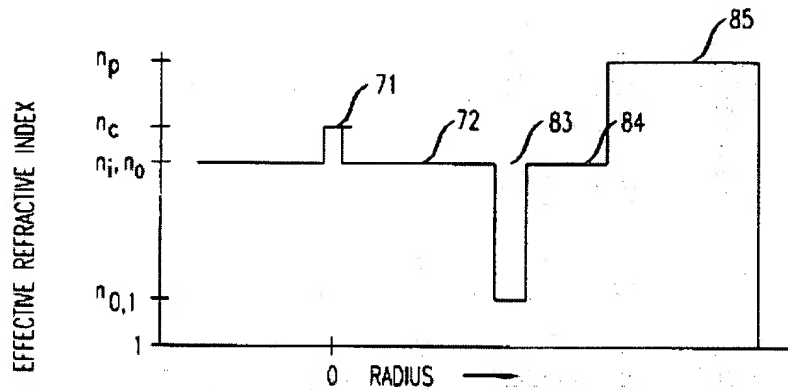
the periodic structure further comprising secondary, elongated elements each having a refractive index being larger than that of any material adjacent thereto and any material adjacent to a primary element, each secondary element having a centre axis extending in the longitudinal direction of the fibre.

The cited references, DiGiovanni et al. ('236) and DiGiovanni et al. ('652), fail to show this arrangement.

Firstly, it should be noted that the inner and outer cladding region of Figure 5 of DiGiovanni et al. ('236) comprising, respectively, first (52) and second (53) cladding features **do not** disclose a periodic structure, as also stated in col. 5, lines 39-40. The second cladding features (53) thus CANNOT be taken to disclose the "secondary elements" of the present invention (because they are NOT part of the "periodic structure").

Secondly, the Examiner states on pages 2-3 of the office action that Figure 8 in DiGiovanni et al. ('652) (reproduced below) discloses a core region 71, an inner cladding of lower refractive index 72, and an outer cladding of higher index 84-85.

FIG. 8

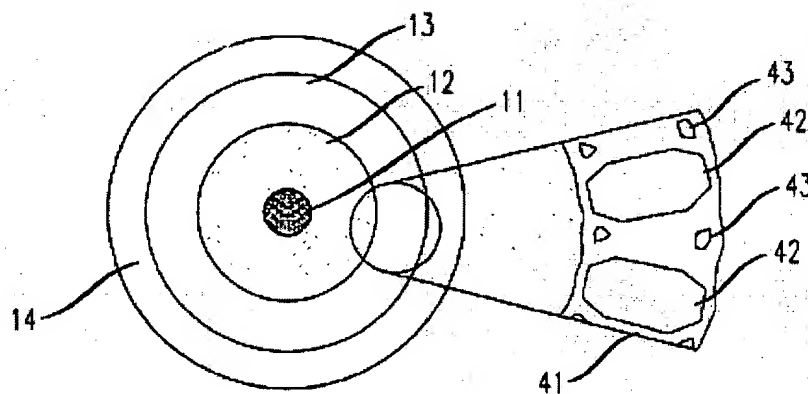


It should be noted, however, that the part of the outer cladding denoted 85 represents a “polymer coating” that “does not have any effect on the optical properties of the fiber but is generally provided to strengthen the fiber” (*cf.* col. 4, lines 48-60). Further, DiGiovanni et al. (‘652) **does not** teach a secondary element having refractive index that is *higher* than its background refractive index (and also higher than the background refractive index of the primary elements).

In Figure 4 of DiGiovanni et al. (‘652) (reproduced below), reference numerals 42 and 43 refer to air space from the openings (42) of the capillary tubes and the interstitial spaces (43) *between* the outer peripheries of the capillary tubes, respectively. The Examiner argues (page 3, first paragraph of the office action) that this discloses “elongated/longitudinal element[s] [that] can be surrounded by air gaps 43, thus it has a higher index than any material adjacent thereto.” The Examiner apparently takes the support structures 41 between the air holes as the “secondary” elongated elements and the air gaps, 42, 43 as the background material (material adjacent thereto). This does not seem to be a consistent way of viewing the structure. One must decide whether the primary/secondary elements are the elements *enclosed* in a background

material or the complementary structures. It is clear from the description of the present invention that the primary and secondary longitudinal elements are the *enclosed* structures (not the opposite). Further, even if it was appropriate to view the support structures 41 as secondary elements in the meaning of the present patent, they are not part of a “substantially two-dimensional periodic structure.”

FIG. 4



In conclusion, we believe that neither DiGiovanni et al. ('236) nor DiGiovanni et al. ('652) discloses an optical fiber with a core region and a cladding region wherein the cladding region comprises a substantially two-dimensional periodic structure comprising primary and secondary elements, wherein the refractive index  $n(\text{pri})$  of the primary elements is lower than a refractive index  $n(\text{adj-pri})$  of any material adjacent to the primary element, and the refractive index  $n(\text{sec})$  of the secondary elements is higher than a refractive index  $n(\text{adj-pri})$  of any material adjacent to the primary element (*i.e.*,  $n(\text{pri}) < n(\text{adj-pri}) < n(\text{sec})$ ). We thus believe that claims 9, 37, 54, and any claims dependent thereon (claims 10, 38-40, 55-58, 83-86, 99-100, 116-121,

127-128, and 134-135) are not disclosed in or hinted at in any of DiGiovanni et al. ('236) or DiGiovanni et al. ('652) when taken alone or in combination.

It is fundamental that a prima facie case of obviousness requires a showing that each of the claim elements is shown in the cited references. Because this showing cannot be made, the rejection of claims 9, 37, 54, and any claims dependent thereon (claims 10, 38-40, 55-58, 83-86, 99-100, 116-121, 127-128, and 134-135), Applicant respectfully requests that this ground of rejection be withdrawn.

2. In section 4 of the office action (pages 3-4), the Examiner states that the prior art DiGiovanni et al. ('236) and DiGiovanni et al. ('652) reads on claims 79-86 and 97-100, except for the further specifics of multiple cores/core regions, and that it would have been "obvious to one of ordinary skill in the art at the time to modify the prior art to obtain applicant's claims, of which Official Notice is taken, e.g. for motivation of selecting single mode or multimode." This ground of rejection of claims 79-86 and 97-100 is respectfully traversed because each of the recited claim elements is not found in the cited references.

Claims 80-82 and 97-98 depend on claim 79, and claims 83-86 and 99-100 depend on claim 54. As discussed above, the cited references fail to disclose each element of independent claim 54. The Examiner taking "Official Notice is taken ... for motivation of selecting single mode or multimode" does nothing to remedy this deficiency. It is fundamental that a prime facie case of obviousness requires a showing that each of the claim elements is shown in the cited references. This showing cannot be made for the same reasons as discussed above in section 1, as claims 54, 83-86 and 99-100 are not disclosed in or hinted at in any of DiGiovanni et al. ('236) or DiGiovanni et al. ('652) when taken alone or in combination. Therefore, the rejection of claims 83-86 and 99-100 should be withdrawn.

With respect to claim 79, it should be noted that the feature of the core region comprising a first additional elongated element extending in the longitudinal direction of the fibre is neither disclosed in DiGiovanni et al. ('236) nor in DiGiovanni et al. ('652) ("additional" being understood as "in addition to the already mentioned 'primary elements' of the cladding region"). Therefore, the cited references fail to disclose each element of independent claim 79. The Examiner taking "Official Notice is taken . . . for motivation of selecting single mode or multimode" does nothing to remedy this deficiency.

It is fundamental that a prime facie case of obviousness requires a showing that each of the claim elements is shown in the cited references. As discussed above, the cited references fail to disclose each element of independent claim 79. This showing cannot be made, as claims 79-82 and 97-98 are not disclosed in or hinted at in any of DiGiovanni et al. ('236) or DiGiovanni et al. ('652) when taken alone or in combination. Therefore, the rejection of claims 79-82 and 97-98 should be withdrawn.

3. In section 5 of the office action (page 4), the Examiner states that the prior art DiGiovanni et al. ('236) and DiGiovanni et al. ('652) reads on claims 116-121, 127-128 and 134-135, except for the further specific utility of the invention, and that it would have been "obvious to one of ordinary skill in the art to modify the prior art to obtain applicant's claims, of which Official Notice is taken, for the motivation of simpler, less costly method for making . . . PBG/PCF sensors, fiber amplifiers, or lasers." This ground of rejection of claims 116-121, 127-128 and 134-135 is respectfully traversed because each of the recited claim elements is not found in the cited references.

Claims 116-118, 127 and 134 depend on claim 37. Claims 119-121, 128 and 135 depend on claim 79. As discussed above in sections 1 and 2, the cited references fail to disclose

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each element of independent claim 37 or independent claim 79. The Examiner taking "Official Notice is taken, for the motivation of simpler, less costly method for making" does nothing to remedy this deficiency. It is fundamental that a prime facie case of obviousness requires a showing that each of the claim elements is shown in the cited references. This showing cannot be made for the same reasons as discussed above, as claims 37, 79, 116-121, 127-128 and 134-135 are not disclosed in or hinted at in any of DiGiovanni et al. ('236) or DiGiovanni et al. ('652) when taken alone or in combination. Therefore, the rejection of claims 116-121, 127-128 and 134-135 should be withdrawn.

**CONCLUSION**

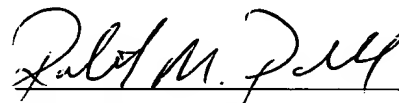
In conclusion, with reference to sections 3, 4, and 5 of the office action, we respectfully argue that the combination of DiGiovanni et al. ('236) and DiGiovanni et al. ('652) does not disclose the present invention as disclosed in the pending claims.

For the above-stated reasons, this application is respectfully asserted to be in condition for allowance. An early and favorable examination on the merits is requested. In the event that a telephone conference would facilitate the examination of this application in any way, the Examiner is invited to contact the undersigned at the number provided.

Respectfully submitted,  
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